

UNIVERSIDADE DE LISBOA  
FACULDADE DE PSICOLOGIA



**ADAPTATION TO UNFORESEEN CHANGE IN  
GEOGRAPHICALLY DISPERSED MISSION TEAMS:  
THE ROLES OF TEAM  
TRAINING AND TEAM FAMILIARITY**

**Diogo Raposo de Oliveira**

**MESTRADO INTEGRADO EM PSICOLOGIA**

**Secção de Psicologia dos Recursos Humanos, do Trabalho e das Organizações**

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**Dissertação Orientada pelo Professor Doutor Luís Alberto Curral**

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*Now is the time...*

*Now* is the time to feel free, because ignorance is a thinner shadow and I can build a career upon that relief;

*Now* is the time to feel wiser, because wisdom is a wider perspective and, from this pinnacle, I can see it all;

*Now* is the time to be proud, because every word I write sounds like accomplishment;

*Now* is the time to be grateful,

And, so, I thank.

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incredible, kind man, and an even better grandfather. To my grandma Fernanda with whom I've shared joys and dances like she was of my very own age. To my grandma Celeste that will always be the eternal child: beautiful, innocent and with endless love to give to everyone around. To my father and to my mother, two sources of inspiration and strength that will always illuminate my path, no matter how far I am from home. And to my most beloved thing in the entire World: my brother, the reason why I cried tears of happiness for the first time ever.

Thanks for giving me one more reason...

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## **Abstract**

Today the world witnesses the course of a technological revolution that has broken down office walls and expanded the horizons of team communication. Teams are no longer confined to a single place at a time, and for that reason some researchers may call them “ubiquitous” (e.g., Marks, 2006). In fact geographic separation has been overcome by the virtuality that has touched and transformed every modern organization.

Despite all the advantages that virtual communication may represent, everyday many virtual teams find themselves struggling because of virtual work. Using fail-safe technology is one way of preventing that from happening; however the focus of prevention should also span human resource policies like training and development of team members regarding virtual work (Duarte & Snyder, 2001). Following that perspective, and taking into consideration other evidences, I hypothesized that both team training and team familiarity have a positive effect on individual perceptions of adaptability. Furthermore I posited that the positive effect of team familiarity on individual perceptions of adaptability is stronger when team training occurs instead of separate training.

An experimental study with 39 individuals was conducted to test these hypotheses. Participants were given scenarios where familiarity and conjoint training were manipulated. Team adaptive performance was measured at the end of each scenario.

Results provided evidences against the hypothesis proposed in this study, however, good insights are provided regarding possible reasons behind that, which I expect to be useful for guiding future research. Implications are discussed and future studies are suggested.

*Keywords:* mission teams, virtual teams, team training, team familiarity, team adaptability, adaptive performance.

## ***Resumo***

Salas, Dickinson, Converse, & Tannenbaum (1992) definem “equipa” como um grupo específico de duas ou mais pessoas que têm objetivos ou propósitos em comum e interagem de forma dinâmica, adaptativa e interdependente, em função de papéis ou funções específicas, de forma a atingirem aqueles objetivos.

Os processos de se desenrolam a partir do âmago de uma equipa fortalecem as empresas, permitindo-lhes responder com maior eficácia tanto à competição como à colaboração que, hoje em dia, ultrapassa barreiras organizacionais, geográficas e temporais. As equipas apresentam um leque de vantagens muito superior ao do trabalho individual: são capazes de produzir modelos mentais partilhados, processos compensatórios, e estados afetivos como a coesão para lidarem eficazmente com a complexidade e o *distress* que tingem o dia-a-dia profissional (Orasanu & Salas, 1993). Estas vantagens e outras consubstanciam-se em importantes ganhos organizacionais que se podem traduzir em níveis superiores de eficiência, qualidade, segurança, criatividade, e até adaptabilidade (Banker, Field, Schroeder, & Sinha, 1996; Burke, Stagl, Salas, Pierce, & Kendall, 2006; Cohen & Ledford, 1994; Foushee, 1984), colocando as equipas numa posição privilegiada do panorama organizacional.

Com o desenvolvimento em massa das tecnologias de informação e comunicação, as equipas de trabalho tornaram-se cada vez mais ágeis e colaboração entre elementos da mesma equipa deixou de estar marcada pela rigidez das barreiras geográficas e temporais. Graças ao uso destas tecnologias profissionalmente, já é possível uma única equipa estar dispersa pelo Globo, mantendo-se em interação.

Apesar de todas as potencialidades da comunicação virtual, continuam a existir muitos grupos de trabalho a sentirem-se prejudicados pela distância geográfica que os separa de outros. Esses efeitos podem ser agravados por diversos fatores, incluindo a percepção de incerteza e de falta de controlo e o *stress* que, amiúde, delas deriva. As equipas de missão (e.g., tripulações de naves espaciais), pelo tipo riscos a que estão sujeitos e importância dos objetivos com que se comprometem, podem acusar o efeito das limitações das tecnologias de comunicação mais do que qualquer outro tipo equipa. Uma forma de ultrapassar essas dificuldades passa pelo investimento em tecnologia de

elevada qualidade, pois não apresenta tantas falhas como aquelas de classe inferior. No entanto, as possibilidades não se esgotam aí. Outra forma de minimizar os efeitos negativos da separação geográfica deve passar pela adoção de políticas de recursos humanos ligadas à promoção da formação e desenvolvimento das equipas ao nível do trabalho virtual (Duarte & Snyder, 2001).

O principal objetivo da presente investigação prende-se com o alargamento da compreensão dos fatores que têm efeito sobre a adaptabilidade das equipas de missão. Mais especificamente, com este estudo, procurei determinar os efeitos da familiaridade de equipa e do treino em equipa nas perceções individuais de adaptabilidade. Procurei, ainda, introduzir uma inovação na literatura ao considerar o efeito da interação das duas primeiras variáveis na última.

Após rigorosa revisão de literatura, lancei as hipóteses do meu estudo. Nelas proponho que tanto a familiaridade de equipa quanto o treino em equipa têm um efeito positivo nas perceções individuais de adaptabilidade, e que o efeito positivo da familiaridade de equipa nas perceções individuais de adaptabilidade é mais forte quando há treino em equipa do que quando há treino separado.

De forma a testar a validade empírica das minhas hipóteses, realizei um estudo experimental com 39 indivíduos. O material experimental fornecido aos participantes incluía, entre outros elementos, dois cenários hipotéticos de missões levadas a cabo por equipas em ambientes extremos, seguidos de um questionário sobre os mesmos. Cada um desses questionários precedia um conjunto adicional de três questões às quais os participantes deviam responder selecionando uma de três opções: “sim”, “não” ou “não sei”. Estas questões foram integradas no material experimental de forma a possibilitar a avaliação da consistência das escalas adotadas no estudo.

Debruçando-me novamente sobre os cenários, devo esclarecer que cada um deles contava a história de uma missão levada a cabo por uma equipa, com um líder demarcado, que se encontrava subdividida em dois grupos – a equipa de missão em si mesma e o Centro de Controlo Operacional (CCO) – geograficamente separados um do outro. A explicitação dessa distribuição geográfica era propositada uma vez que eu pretendia direcionar a minha pesquisa para as equipas de missão com uma forte dimensão virtual.



Através de cada par de cenários incluídos no material experimental foi possível manipular as duas variáveis do meu estudo – treino em equipa e familiaridade entre a equipa de missão e o CCO. As respostas dadas pelos participantes no âmbito dos questionários espelhavam o modo como eles percecionavam a influência dos eventos e comportamentos descritos nos cenários hipotéticos ao nível das diferentes dimensões da Performance Adaptativa de Equipa (Kozlowski, 1991; Han & Williams, 2008).

Após os participantes terem respondido aos questionários, e após terem-nos devolvido, juntamente com o resto do material experimental, ao experimentador, as respostas obtidas foram exportadas para uma base de dados, e posteriormente sujeitas a análise estatística usando o SPSS 20.0.

No âmbito da análise estatística, o teste das hipóteses resultou na rejeição das três hipóteses formuladas neste estudo. Os resultados poderiam parecer inválidos simplesmente por irem contra toda a fundamentação reunida na secção da revisão de literatura, no entanto, após um trabalho adicional de pesquisa bibliográfica, cheguei à conclusão de que certas características dos cenários constantes no material experimental poderiam ter agido como “variáveis estranhas”, “adulterando” os resultados.

Considere, então, que os resultados associados à hipótese 1 (*“Haverá um efeito positivo da familiaridade entre os elementos da equipa nas percepções individuais de adaptabilidade.”*) tivessem sido influenciados pela variável estranha “longevidade de grupo” (Katz, 1982).

Ao nível da hipótese 2 (*“Haverá um efeito positivo do treino em equipa nas percepções individuais de adaptabilidade”*), a justificação para os resultados encontrados pode-se prender com alguma falta de precisão no modo como foi manipulado a variável treino nos cenários do material experimental. Acontece que a frase escolhida por mim para representar a condição “treino em equipa”, nos cenários em que esta devia manifestar-se, colocava uma ênfase especial no facto de que, durante o treino em equipa, a equipa de missão tinha realizado exercícios de troca de papéis que lhes haviam permitido compreender os requisitos globais da missão. O modo como esse destaque surgiu nos cenários pode ter conduzido aos resultados que, até à data da análise, eram inesperados uma vez que há evidências de que as intervenções de treino em equipa centradas na troca de papéis e responsabilidades entre elementos de equipa (“cross-training”) têm um impacto menos positivo na *performance* da equipa do que a globalidade das intervenções de treino em equipa (Goldstein & Ford, 2002).

Após conhecer o desígnio das hipóteses 1 e 2, qualquer admiração da minha parte relativa à refutação que recaiu sobre a hipótese 3 (*“O efeito positivo da familiaridade da equipa nas perceções individuais de adaptabilidade será mais forte quando há treino em equipa do que quando há treino separado.”*) seria descabida.

Neste estudo pude identificar duas limitações que considero que possam ter condicionado a precisão dos seus resultados. Cada uma delas relaciona-se, respetivamente, com uma das bases cognitivas e um dos processos psicológico responsáveis pela capacidade dos participantes do meu estudo de responderem às perguntas do questionário que lhes foi entregue.

Neste estudo, eu procurei conhecer os efeitos provocados pelas variáveis independentes na variável dependente através do modo como os indivíduos acreditavam que os eventos e interações ocorridas nos cenários de missão considerados poderiam influenciar as suas atitudes caso eles próprios tivessem feito parte das equipas de missão referidas nesses cenários. A primeira limitação do estudo prende-se com o facto desse processo reflexão, necessário para dar resposta ao questionário, depender em grande parte da capacidade do indivíduo para aceder às suas ‘estruturas de crença’ (*‘belief structures’*), as quais se regem mais por princípios de subjetividade do que de ‘realismo’ propriamente dito.

A segunda limitação referida neste estudo diz respeito ao processo psicológico necessário para que os participantes do estudo pudessem perceber de que forma reagiriam se estivessem nas condições experienciadas pelas equipas referidas nos cenários de missão apresentados. Esse processo designa-se de ‘simulação mental’. É ele que permite aos indivíduos, cruzando dados de cenários hipotéticos com as informações provenientes das ‘estruturas de crenças’, perceberem como poderiam reagir numa situação dessas. Apesar das simulações mentais serem uma das ferramentas mais eficazes utilizadas por investigadores para manipular estados afetivos (e.g., Larsen & Ketelaar, 1991; Morrow & Nolen-Hoeksema, 1990; Strack, Schwarz, & Gschneidinger, 1985; Wright & Mischel, 1982), os quais podem ser úteis para prever os comportamentos que um dado indivíduo desempenharia num cenário hipotético ou futuro; o potencial das simulações mentais para ajudarem a compreender as dinâmicas do comportamento humano é limitado. A fragilidade do potencial preditivo das ‘simulações mentais’ tem na sua origem diversos fatores, no entanto, cinto-me a

destacar que o conteúdo dessas simulações deriva da rede de informações de que o *self* dispõe mentalmente e que resulta da experiência passada (Hawkins & Blakeslee, 2004; Dudai & Carruthers, 2005; Addis, Wong, & Schacter, 2007; Buckner & Carroll, 2007). Visto que a amostra deste estudo é composta na sua maioria por indivíduos, estudantes, que nunca tiveram contacto com as exigências de um contexto profissional e, muito menos, com cenários reais de missão, dificilmente as ‘simulações mentais’ que conduziram às respostas que os participantes do estudo deram no questionário terão um grau de verosimilhança suficientemente elevado para considerar que essas respostas podem ser a chave para a compreensão da forma como as variáveis ‘familiaridade de equipa’, ‘treino em equipa’ e ‘adaptabilidade’ se relacionam efetivamente no contexto natural das missões. Outra fragilidade das ‘simulações mentais’ que pode ter condicionado decisivamente os resultados do presente estudo tem a ver com a tendência das mesmas para ignorarem aspetos da *performance* como a adaptação (Gilbert & Wilson, 2009), sendo também insensíveis aos aspetos de um evento capazes de promover a mesma ou de inibi-la (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Gilbert, Lieberman, Morewedge, & Wilson, 2004; Gilbert, Morewedge, Risen, & Wilson, 2004; Gilbert & Ebert, 2002).

A partir dos resultados obtidos e da análise global e específica das limitações do presente estudo, proponho algumas recomendações para a prática da investigação. Em primeiro lugar, considero que as simulações mentais não devem ser usadas como uma ferramenta para conhecer melhor o modo como a adaptação ou a adaptabilidade se relacionam com outras variáveis. Adicionalmente, defendo que os resultados de estudos que envolvam a avaliação do impacto de certas variáveis noutras, através de respostas dadas por indivíduos a questionários, devem ser analisados com rigor, especialmente se esses indivíduos não estão próximos de ou, pelo menos, familiarizados com o contexto natural em que aquelas variáveis interagem.

Para além de dar resposta às limitações do presente estudo, investigação futura poderá ampliar este trabalho de diversas formas. Sugiro que, de futuro, as relações entre as três variáveis visadas nesta investigação sejam exploradas através de estudos de campo. Para além disso, também considero pertinente reforçar o estudo da influência da familiaridade de equipa na adaptabilidade, tentando compreender o modo como a familiaridade da tarefa pode moderar esse efeito.

## **Introduction**

Salas, Dickinson, Converse, & Tannenbaum (1992) define teams as a distinguishable group of two or more individuals who share common goals or purposes and interact dynamically, adaptively, and interdependently, accordingly to specific roles or functions, in order to accomplish those goals. Team-based forms of organization become a preference when companies face growing competition and collaboration across organizational, geographic, and temporal boundaries. Under such circumstances, teams offer a better deal than individual work once collectives can produce shared mental models, compensatory processes, and affective states such as cohesion to perform more effectively within complex and stressful contexts that are very characteristic of modern times (Orasanu & Salas, 1993). Ultimately, team gains can culminate in enhanced efficiencies, quality and safety improvements, creativity, and/or adaptation (Banker, Field, Schroeder, & Sinha, 1996; Burke, Stagl, Salas, Pierce, & Kendall, 2006; Cohen & Ledford, 1994; Foushee, 1984), triggering a resonance that spreads by the entire organization influencing key measures of business performance (e.g., Mathieu & Leonard, 1987). As Marks (2006, p. i) states “teams are ubiquitous. Whether we are talking about software development, Olympic hockey, disease outbreak response, or urban warfare, teams represent the critical unit that ‘gets things done’ in today world”.

Furthermore, teams promote adaptability, which is another subject that modern times have made crucial for companies. Due to the predictability of changes, including the ones that are unforeseen, companies cannot afford to not have the capacity to successfully overcome them. That capacity is called ‘adaptability’. Without it, companies may fight back adversity, but will never break through it (Burke et al., 2006).

When one merges these important pieces of the organizational puzzle, another one steps in. I speak of team adaptability. Although this topic has its roots in two spheres of investigation widely explored, over 30 years ago Behling, Coady, and Hopple (1967) noted significant gaps in researchers’ understanding of some forms of team adaptation. Once research has demonstrated that a team’s ability to perform effectively after an unforeseen change depends heavily on prior adjustment of the

team's role structure to the set of requirements introduced by that change (Hutchins, 1996; LePine, 2003), studying these gaps in knowledge may be of great value. Just recently they have started being filled (e.g., Arrow, 1997; Hutchins, 1996; Kozlowski, Gully, Nason, & Smith, 1999; LePine, 2003; Marks, Zaccaro, & Mathieu, 2000; Waller, 1999).

The main goal of the present research was to add more knowledge to that field, by extending the scientific comprehension of the factors that influence the ability of a team to react to unforeseen changes, accomplishing positive outcomes.

A more specific purpose of this study was to increase understanding of the perceived relationships between team adaptability and team training and between team adaptability and team familiarity in the context of teams conducting missions in extreme environments and facing unforeseen changes that demand adaptation. My study also aims to innovate by considering the power of the interactions between team training and familiarity in such contexts.

Thereby, the present study aims not only to illuminate the relations described above but also to contribute to advances in research and, ultimately, provide mission team managers with guidance to improve adaptability in their teams. It is expected that results can also be extended to other domains outside the mission universe.

### ***Team Adaptability***

Adaptability is a main concern in organizations. If it is true that businesses are continuously evolving and that competition rises proportionally, it's also reasonable to believe that the companies who thrive are the ones who have higher levels of adaptability. Team adaptability is one of the pieces of this broader concept, and it has become very important given the power acknowledged to teams within the business world.

Team adaptability is directly related to the capacity of a team to adapt to a new set of requirements (Chan, 2000; Cohen and Bailey, 1997). Thus, teams searching for adaptation must respond to new challenges and circumstances with the appropriate behavioural solution which may include adjusting the focus, as well as plans, priorities

and actions (Burke et al., 2006; Kozlowski et al., 1999; Pulakos, Arad, Donovan, & Plamondon, 2000).

Team performance is another concept that is also related to team adaptability. A team with more adaptability is more capable of finding innovative solutions and, therefore, is more likely to have better performances than teams less adaptive.

Based on the above, team adaptability is conceptualized here as the capacity of a team to effectively adapt to significant changes in its environment.

### ***Familiarity and Adaptability***

As communication technologies develop, the possibilities given to action teams to become more dispersed arise. Thus, teams that once were restricted to one location at a time and used to conduct operations mainly face-to-face, today can be divided into smaller units geographically dispersed that make use of technology to communicate among them.

This new model of teams has many advantages, including the ability of team members to contribute with diverse expertise and knowledge. Nevertheless, disadvantages should be noticed too. The dispersion of team members tends to generate multiple knowledge gaps, resulting in communication difficulties that may damage the team's performance. Because of these gaps, team member's dispersed across different locations cannot hold certainties regarding the contextual knowledge of their distant partners, which can translate into the absence of a common context for working (Gluesing et al., 2003). Since the existence of a common context is one of the reasons behind the success of knowledge work (Mohrman, Gibson & Mohrman, 2001; Boland Jr. & Tenkasi, 1995; Brown & Duguid, 1991), teams must strive to overcome these gaps.

Communication and group identity may help teams in such quest, shortening the psychological distances among dispersed team members (Wilson, O'Leary, Metiu & Jett, 2008; Wiesenfeld, Raghuram & Garud, 1998; Wiesenfeld, Raghuram & Garud, 2001) and, thus, fostering closer interpersonal relationships (Wilson, Straus & McEvily, 2006) and developing a level of shared group identity identical to that held by non-

dispersed groups (Bouas & Arrow, 1996). When shared group identity exists, team members become united by a psychological tie that compensate for the physical and contextual distance that separates them (Hinds & Mortensen, 2005).

Research also points out to team familiarity as a factor capable of impacting positively team satisfaction (Stark & Bierly, 2009; Bierly, Stark & Kessler, 2009) and capable of compensating for the effects of spatial distance (Assudani, 2011). Spatial distance, beyond contributing to create knowledge gaps in teams, has been found to halt the coordination flow and to cause substantial delays in problem solving and in team processes during initial stages of team member interaction (Herbsleb & Mockus, 2003). Team familiarity may be the answer managers seek in order to help geographically separated team members to mitigate the problems inherent to their condition once it allows teams to maintain their effectiveness even in circumstances where communication is less frequent. According to Griffith, Sawyer and Neale (2003) the knowledge team members need to access in order to perform their tasks well become more accessible when the team has formed some form of collective knowledge. Plus, because team familiarity provides team members a common ground, they should more easily anticipate each others' actions, understand with more accuracy the meaning of the messages exchanged during team interaction, and conceive and adopt more effective procedures.

In line with those findings and based on his own research, Assudani (2011) argues that familiarity, defined here as the existence of prior working relationships among team members, may be critically linked to the performance of dispersed teams. She explains that the prior working experiences among (dispersed) team members that define team familiarity lead to perceived absence of gaps at the levels of the transactive memory system (TMS) and mutual knowledge. TMS provides team members with a representation of which person knows what (Lewis, 2003), enabling the codification, storage, retrieval, and communication of group knowledge (Lewis, Lange, & Gillis, 2005). Being that knowledge the basis of problem-solving within a team, it is reasonable to consider that teams of familiars will more readily respond to situations demanding for team adaptation than teams of non-familiars. Following this theoretical line, Austin (2003) conducted a study involving 27 manufacturing teams (263 individuals) who had worked together for an average of 1.9 years, and found team

performance to be anchored on how well individual team members knew the knowledge resources of the team, and how to apply those resources to new situations.

It is also important to note that, when team members share experiences, trust may be developed, yielding performance benefits (Uzzi, 1997). Trust, which can help creating strong ties between team members, may improve problem solving by its effects on expanding creative thinking within the team (Sosa, 2011). When team members start binding affectively, psychological safety may emerge. This phenomenon results from the shared belief that the team is safe for interpersonal risk taking (Edmondson, 1999). It may not affect directly the team's performance but it can help the development process because psychological safety is a variable that can lead individuals to feel free to speak up and display contributions during that process. But psychological safety can manifest itself in other ways, proving to be more relevant than it seemed so far. For instance, Espevik, Johnsen, Eid, and Thayer (2006) found physiological arousal experienced by the crew during attack simulations to be inversely proportional to the experience they had working together. Positive beliefs related to positive social acceptance and psychological safety, like the ones that emanate from trusting relationships, exist inside a team, are the first step towards enabling learning and improving performance (Edmondson, 1999; Gruenfeld, Mannix, Williams, & Neale, 1996; Hinds, Carley, Krackhardt, & Wholey, 2000; Siemsen, Roth, Balasubramanian, & Anand, 2009). The fact that team members can enjoy a psychologically safe environment in their workplace makes them more prone to take risks and share their mistakes, triggering experimentation and innovative thinking (Edmondson, 1996; Lee, Edmondson, Thomke, & Worline, 2004). Consistent with this statement is the fact that team psychological safety can instigate the development of a cognitively "playful" attitude among team members. It has been shown that when subjects perform their tasks with such attitude, which is embedded in the willingness to experiment and play with the task situation, they tend to perform better on training tasks than subjects who approach the task with more caution (Martocchio & Webster, 1992).

Two other consequences that can emerge from repeated collaboration are the development of social capital and the improvement of the ability to coordinate actions (Goodman & Leyden, 1991). Also, such form of recurring interaction may lead team members to build rapport and, so, avoid the process losses that usually take form in the early stages of group formation (Steiner, 1972).



Finally, familiarity may also create team expertise, which is related to situation assessment, a *sine qua non* condition for adaptive performance (Burke et al., 2006). When team expertise exists, team members are very knowledgeable about each other and, therefore, become very efficient in terms of recognizing internal cues suggesting that some teammate is not behaving or performing as he/she should be. Hence, team members who worked together in the past may perform better than team members who are unfamiliar in terms of situation assessment – identifying and interpreting internal cues that express the need for adaptation – and accurate responsiveness to the perceived demands. Hence, I propose that:

Hypothesis 1: *There will be a positive main effect of team member familiarity on individual perceptions of adaptability.*

### ***Team Training and Adaptability***

When addressing team training, it's important to shed light over the basic concepts underlying it. I begin by presenting two definitions in order to set our framework and, thus, be able to take solid steps in the study of team training and its relationship with adaptability.

Training can be described as a systematic, planned intervention designed to facilitate the acquisition of job-related KSAs (Goldstein & Ford, 2002). Concerning team training, Salas & Cannon-Bowers (1997, p.254) describe it as “a set of tools and methods that, in combination with required [team-based] competencies and training objectives, form an instructional strategy”.

The reasons that motivate companies to support team training are related to its ability to produce changes in numerous areas that relate to proficuous teamwork, like knowledge, skills and/or attitudinal competencies (KSAs), as well as to individual members engagement to the team processes and performance that allow for team improvement (Salas & Cannon-Bowers, 1997, 2000). Additionally, team training allows individuals to learn how to make better decisions (Orasanu & Fischer, 1997), to perform better under stress (Driskell, Johnston, & Salas, 2001), and to make less mistakes (Wiener, Kanki, & Helmreich, 1993).

Salas et al.'s (2008) findings reinforce the perspective adopted in this thesis. According to them, organizations undertaking team training interventions tend to

enhance team outcomes, which can be classified as cognitive outcomes, affective outcomes, teamwork processes, or performance outcomes. The last form of outcomes may include the adaptation accomplished by a team performing in adverse circumstances. Although each one of them is labeled here as different and unique, they are indeed connected and closely related. For instance, affective outcomes may influence performance outcomes, and be influenced by certain teamwork processes.

Two examples of cognitive outcomes related to team training are the shared mental models that emerge among team members and the growth of expertise within the team. Shared mental models refer to compatible views of equipment, tasks, and team member roles and responsibilities, which are important for team members to adapt proactively in the professional context (Burke et al., 2006; Stout, Cannon-Bowers, Salas, & Milanovich, 1999; Waller, Gupta, & Giambatista, 2004). As a matter of fact, Marks and colleagues (2000) found that development of a shared mental model is a better predictor of performance under new situational requirements than under routine work conditions. Nevertheless, shared mental models can also explain why team members characterize and diagnose a situation in the context of the team objectives in the same way. When such shared mental models exist, team members' situation awareness should overlap (Endsley, 1995), and such overlap could likely signal a team more capable of adapting to novel situational requirements (Burke et al., 2006). Behind this relationship is the fact that team situation awareness allows team members to easily converge to a single interpretation of a cue or cue pattern related to a significant environmental change with implications for performance. Research suggests that the speed with which environmental changes are recognized and appropriate responses are enacted is related to subsequent team adaptability (Waller, 1999). It is also known that teams spend time together and for that reason the meaning of different cues spreads easily among the team members through communication (Burke et al., 2006). Hence, team training should be positively related to team adaptability.

Team member affective outcomes due to team training interventions may include socialization, trust and confidence in team member's skills (Salas et al., 2008). Team psychological safety is another outcome that fits into this category and it is certainly positively related to the three examples of affective outcomes already displayed.

The way in which psychological safety may arise is through critical incidents that reveal the behavioral path of future better team performances. Other situations that may help building up a sense of psychological safety involve mutual positive interaction among team members, and these situations become even more helpful when such interactions occur under stress (Burke et al., 2006). The importance of psychological safety is especially evident in mission teams whose members are required to live and work together. In space missions, for instance, astronauts are expected to perform, not only achieving technical objectives, but also maintaining a healthy psychological and social environment (Schmidt, Keeton, Slack, Leveton & Shea, 2009).

Team training provides levels of interpersonal proximity that enables team members to forge close and positive relationships with each others. Such training can also involve simulations and challenges that lead team members to experience high levels of stress and sometimes even face critical incidents (Burke et al., 2006). Once these experiences promote an atmosphere of trust and respect and, thus, foster psychological safety, which is related to higher willingness to participate in the team's decisions and performances, team training may be positively related to increased psychological safety and, therefore, to the level of contributions of each team member.

Another consequence of existing team psychological safety is, as referred in the last section, the development of a cognitively "playful" attitude, which has a positive influence on performance, as previously stated (Martocchio & Webster, 1992).

Teamwork processes also benefit from team training interventions. At this level one can notice positive changes such as more feedback exchange among team members and more cooperative behaviors like offering and accepting guidance, monitoring to avoid mistakes, and being willing to support other team members in different circumstances.

Feedback exchange is a benefit of many benefits. According to Gist and Mitchell (1992) frequent exchange of feedback during training for a complex task can maximize self-efficacy, which is positively related to increased performance. Karl, O'Leary-Kelly, & Martocchio (1993; Latham & Locke, 1991; Martocchio & Webster, 1992) argue that only positive feedback origins higher self-efficacy. However, specific negative feedback is useful to correct trainees performance when they are using behaviors, routines and/or strategies that are ineffective (Garner, 1990; Wofford & Goodwin, 1990). This findings

may reinforce the idea that the right amount of feedback (whether is positive or negative), in the right timing, always benefits performance.

We argue feedback exchange happens in a larger scale in team training than in contexts where training is individual because the first is characterized by a number of interactions that widely surpass those that happen in the context of separate training.

Guidance is another form of interaction that also improves performance. It contrasts with “feedback” once it draws upon a proactive “feedforward” mechanism which means that it is based on the act of providing advice regarding the best way of attaining preset goals. Tennyson (1980, 1981) has found evidences that, through this process, trainees can learn more efficiently and are less likely to prematurely quit the pursuit of their goals. I consider that, in team training, guidance can be more profuse and richer than in separate training. Although one may argue that, in separate training, the trainers’ attention is directed to one single individual that, for that reason, can receive more feedback than if he/she was undertaking team training. I contend that, in team training settings, when psychological safety exists, not only trainers provide feedback, as team members are likely to assume the role of each others’ advisors, sharing their own perspectives about what should be done in order to reach better performance levels.

The aforementioned forms of interaction among team members can be easily paralleled with other team processes such as mutual performance monitoring and back up behaviors. Team training allows members to get to know each other and their respective jobs, which in turn helps them to know to whom to provide help, or ask for it, in moments of need. Since that awareness is the basis of mutual performance monitoring and backup behaviors (Burke et al., 2006), team training should be more likely to instigate these behaviors than separate training.

As stated so far, team training tends to enhance a wide range of cognitive, affective and process-related outcomes that positively influence performance.

Consequently, the following hypothesis is advanced:

*Hypothesis 2: There will be a positive main effect of team conjoint training on individual perceptions of adaptability.*

### ***Familiarity, Team Training and Adaptability***

The hypothesis presented so far reflect my own expectations about how team training and familiarity influence, separately, individual perceptions of adaptability, however, their conjoint effect should also be subjected to analysis.

A possible moderation of the effect of team familiarity on team adaptability by team training may come from the fact that this last construct creates a shared place for team members' interactions which allow to create familiarity among them, and even to go beyond that and forge close relationships (Balkundi & Harrison, 2006). By providing a context that enables the development of familiarity among team members, team training can be seen as possible moderator of the relationship between team familiarity, which, again I state, stands for the existence of prior working relationships among team members, and individual perceptions of adaptability.

Thus, it is reasonable to hypothesize the following:

*Hypothesis 3: The positive effect of team familiarity on individual perceptions of adaptability will be stronger when team training occurs in place of separate training.*

## **Method**

### ***Participants***

The study sample consisted of 39 individuals selected out of a group of 80 individuals, randomly chosen, attending the Psychology course at the Faculty of Psychology of the University of Lisbon. The mean age of the participants was approximately 22 years-old; the mode and minimum age was 18, and the maximum was 40 years-old; the standard deviation was of 6.3. From a total of 39 participants (*N*), 26 (66.7%) were females and 13 (33.3%) were males. The criteria to select the participants had to do with which variables the questionnaire they received aimed to test. Once my

study can be seen as a branch of a broader investigation designed to evaluate the mind's perception of how certain team variables, including the ones of my study, relate to each others, I had to restrict our sample to those individuals whose scenarios (included in the experimental material provided), could, together, cover all the three variables relevant to the present investigation, i.e., team training, familiarity, and team adaptability.

### ***Procedure***

For the purpose of my study, students from a class of Psychology were invited to participate in it without any reward or punishment regardless their. From that request resulted a group of participants who were subsequently asked to complete a questionnaire designed to assess their perception of how the latent dimensions conveyed in it relate to and interact with each others.

Instructions and complementary information were provided to the participants in order to allow them to complete the task with the level of accuracy required. The average duration of the task was approximately 15 minutes. During that time, the participant had the chance to write (not mandatory), in a section of the questionnaire saved for that purpose, some personal data (gender, age, academic qualifications), which was guaranteed to be confidential.

After the participants had answered to the questionnaires and returned them along with the rest of the experimental material, the answers were exported to a database, and later subjected to statistical analysis. To test the research hypothesis I used descriptive statistic analysis (means, standard-deviation, correlations), and repeated measures (F-test and Eta-square for between-subjects and within-subjects effects).

### ***Experimental Material***

The experimental material given to the participants began with two hypothetical scenarios of missions undertaken by teams in extreme environments, followed by questions about these scenarios. Each set of questions was immediately followed by an additional group of 3 different questions to which the participants could answer using one of three options: 'yes', 'no', or 'I don't know'. These questions were placed in the experimental material to enable the assessment of the consistence of the scales adopted by me. Furthermore, a distracter task "find-the-differences"-like was

introduced immediately after this additional group of questions (and before the next scenario) in order to avoid potential order or learning effects from affecting participants' answers, despite of all the efforts undertaken by experimenters to randomize both the distribution of the experimental material by the participants and the sequential order of the scenarios.

Focusing again on the scenarios, I must clarify that each scenario told the story of a mission undertaken by a team which had an established leader and was found subdivided in two groups – the mission team itself and the Operational Control Center (OCC) – geographically separated from each another. Such geographical distribution was deliberate once I intended to focus my research on virtual teams.

Through each pair of scenarios encountered in each questionnaire, I was able to manipulate the two predictive variables of my study – team training and familiarity between the mission team and the OCC. The answers given by the participants to the questionnaires concerned how they perceived the influence of the events and behaviors described in the hypothetical scenarios on the postulated dimensions of Team Adaptive Performance (Kozlowski, 1991; Han & Williams, 2008).

In each scenario was described part of two distinct missions conducted by two different action/mission teams. Both scenarios had an identical structure: they start by presenting a character (“João”/ “Ricardo”) that personifies the established leader of the mission team, and it is told that he is part of a team of specialists that were recruited to undertake a mission in some place environmentally hostile on earth, during a certain period of time; then are offered descriptions about the context in which this team will be operating and how team members will be able to communicate among them and with people outside of the operation; the composition of the team is revealed and the strong interdependence of the team members is pointed out; it is told that the main character have undergone 5 years of intensive training, as well as his team, in order to be ready to face the challenges of the mission; then, it's asked the participant to imagine that 6 months have passed since the beginning of the mission and now the team finds itself in one of the most adverse situations experienced so far – the environment creates instability to the team's vehicle and, suddenly, the mechanical arm that is attached to the vehicle and operated by the main character suffers a damage, requiring the team to stop the operation; then one can read that the team asks for support to the OCC that is geographically separated from the team. The team follows the recommendations of the OCC but, although they appear to be effective, the problem rapidly returns and team's

situation gets even more complicated, placing the team under extreme jeopardy; then the mission team turns again to the OCC in search of further indications.

Whereas the similarities among scenarios ensured part of the internal validity of this study, the differences existent among them allowed for the effective manipulation of the predictive variables. Since familiarity was manipulated within subjects, differences in terms of this construct could be found between the two scenarios of each questionnaire. On the other hand, team training was manipulated between subjects, which means that differences in terms of this construct could not be encountered between the two scenarios of each questionnaire, but rather from a broader perspective, i.e. between the scenarios of the group of participants whose scenarios encoded the team training condition and the scenarios of the group of participants whose scenarios encoded the individual training condition.

More details concerning variable manipulation are displayed below.

### ***Manipulations***

The present study aims to extend understanding of the effects of team training and team familiarity on team adaptability. Hence, I assumed team training and team familiarity as the predictive variables, and team adaptability as the dependent variable of my study. As I manipulate the first pair of variables, I expect to understand its individual and conjoint effects upon team adaptability.

Hence, an experimental study with four conditions (2X2 within-between) was conducted. The variable “familiarity” was manipulated ‘within groups’ and the variable “team training” was manipulated ‘between groups’, two versions of the questionnaire were created in order to cover the study of every possible combination of the variables manipulated.

Approximately half of our experimental material/scenarios encoded the team training condition in both scenarios, while the rest of them encoded, at the level of their scenarios, the individual training condition. The first condition was clarified by the sentence “sentence “During 5 years of intensive training, through training activities and team training missions, João (the team leader) and his team became familiar with the team that will be in command of the OCC. Both teams took part in simulation training activities where team members had to switch roles. By doing so, both teams were able to understand the type of tasks and challenges that they will have to cope with, and



realize that the two of them are crucial for the success of the mission.”, whereas the individual training condition was encoded in the sentence “In total, it took 5 years of intensive training for Ricardo (the team leader) and his team to be able to carry out this mission.”

On the other hand, team familiarity was manipulated within subjects. This type of manipulation required me to introduce two scenarios in each questionnaire. In one of these scenarios a mission team was described as having familiarity (prior shared working experience) with the OCC member they made contact with during a critical part of the occurring operation, whereas the other scenario introduced a mission team not familiar with the member of the OCC they contacted also in a moment of danger.

The familiarity condition was clarified in one of the scenarios through the following sentence: “Communicating the fact to the OCC, João (the team leader) and his team obtain response from José who is the OCC member with whom they usually work on the mission.” The non-familiarity condition could be recognized in the other scenario through the sentence “Communicating the fact to the OCC, Ricardo (the team leader) and his team obtain response from a OCC member with whom they have never worked before during the mission.”

The benefits of having two scenarios in each questionnaire extended beyond the possibility of manipulating effectively the team familiarity. This characteristic also allowed to consolidate the reliability of the answers given by the study’s participants.

## ***Measures***

*Adaptability:* The scale of adaptability used in this study was adapted from the scale of Team Adaptive Performance of Han & Williams (2008). In order to achieve successful adaptation of the scale to Portuguese language, the methodology of ‘back translation’ was used. For this purpose, I contacted two researchers with expertise in English language who accepted to carry out the process of translation and adaptation of the items of the scale in question.

To the image of the original scale, the scale I used comprised 14 items, reflecting the 3 theoretical dimensions of Team Adaptive Performance postulated by Kozlowski and colleagues (1999): network selection, network invention, and coordination maintenance. The reliability of the scale used was high (superior to .70), with Cronbach’s Alfa = .90. Participants answered to the questions displayed in the

questionnaire through the items of a Likert scale that ranged from (1) *totally disagree* (6) *totally agree*.

Additionally, I conducted an exploratory analysis of main components and the results supported the factorial structure proposed by the literature.

*Control Variables:* Based on literature review I decided to use gender and age as the control variables of this study.

Although much of the investigation on the impact of demographic diversity (gender, age, race/ethnicity) on group performance doesn't support the existence of a reliable relationship between these two constructs (e.g., Jehn, Northcraft, & Neale, 1999; Pelled, Eisenhardt, & Xin, 1999; for a meta-analysis see Webber & Donahue, 2001), some evidences may suggest the opposite. For instance, Bantel & Jackson (1989) found a positive relationship between demographic diversity and performance. In contrast, but also in defense of a significant relationship, Williams & O'Reilly III's (1998) study suggested that forms of diversity that included age influenced negatively team's innovativeness. Negative results were also found by Tsui, Egan & O'Reilly III (1992) for the relationship between gender (and race) diversity and organizational commitment.

Taking into account the inconsistencies reported in literature about the nature of the relationships between gender and performance and between the later and age, we found that not assuming these two demographic constructs as our control variables could eventually result in loss of important data.

## Results

Table 1  
*Means and Standard Deviations for Team Adaptability*

	Training		
	Conjoint	Separate	Total
Familiar	4.93(.31)	4.86(.45)	4.88(.40)
Non-familiar	4.34(.40)	4.98(.87)	4.61(.70)
Total	4.5(.46)	4.91(.65)	

*Note.* Data presented follows the structure  $M(SD)$ .

The statistical analysis of the data collected from the questionnaires was made using SPSS 20.0.

Table 1 shows the means and standard deviations for team adaptability under different conditions of team training and team familiarity. I used Repeated Measures ANOVA for hypotheses testing. Contrary to our predictions, there was no significant differences in perceptions of adaptability between the groups with conjoint team training and separated team training [ $F(1,18) = .024, p < .57$ , Partial  $\eta^2 = .04$ ], thus rejecting hypothesis 1 (*“There will be a positive main effect of team member familiarity on individual perceptions of adaptability.”*).

Hypothesis 2 (*“There will be a positive main effect of team conjoint training on individual perceptions of adaptability”*) also didn’t found support in the results provided by statistical analysis. In other words, team familiarity did not produce a significant positive effect on perceptions of adaptability [ $F(1,18) = .024, p < .22$ , Partial  $\eta^2 = .02$ ].

In line with the later results, the author’s expectation addressed in hypothesis 3 (*“The positive effect of team familiarity on individual perceptions of adaptability will be stronger when team training occurs in place of separate training.”*) also failed to be proven. Results suggested that the effect of team training on individual perceptions

of adaptability was not more positive under conditions of team familiarity [ $F(1,18) = .003, p < .84$ , Partial  $\eta^2 = .002$ ].

In the next section the results are summarized and discussed.

## **Discussion**

The present research was conducted in order to examine the degree to which team training and team familiarity relate to perceived team adaptability. Results of the study revealed that neither team familiarity nor team training positively influences perceived team adaptability. Accordingly, the potential of the interaction between team training and team familiarity to produce a condition highly inductive of positive perceptions of team adaptability also failed to be proven. As discussed above, results can be understood in light of research not addressed yet in this study, and by taking into account some methodological limitations.

My goal was to try to get an accurate picture of the relationships that individuals believe to exist among the aforementioned variables in the context of virtual teams facing situations characterized by extreme conditions and unexpected change. By doing so, I expected to reinforce the findings of the body of research on team adaptability and to build on that with new data that could motivate novel field research on the subject.

The legitimacy and strength of a study based on a questionnaire designed to assess people perceptions about the way reality occurs is deeply rooted in the nature of mental simulations. Mental simulation is the imitative representation of an event or series of events (Taylor & Schneider, 1989). In some cases it may correspond to cognitive construction of hypothetical scenarios, such as deciding how to respond to an emergency situation (Taylor & Schneider, 1989). The reason why mental simulations are often considered useful for scientific purposes, like the one this study sustains, concerns the fact that they tend to obey the constraints of reality (Kahneman & Miller, 1986). Typically, when people simulate they create highly specific settings and behaviors that match the way social reality occurs. As research by Hayes-Roth & Hayes-Roth (1979) showed, imagining how an event will occur may provide

information about that event. Hence, simulations are as specific as social interaction, and, because of they evoke information about social roles, social settings and specific people (Taylor, Pham, Rivkin, & Armor, 1998), they may also provide good insight about how to react/adapt to certain events. Taylor and colleagues (1998) address this adaptation issue by stating that mental simulation spans the tasks of self-regulation and coping, including the management of affective states (e.g., emotions) and the process of planning and solving problems.

Because mental simulations not only allow individuals to cognitively construct hypothetical scenarios based on realistic constraints, but also permits them to project possible coping and self-regulation behaviors for adjustment to social and situational demands, I found pertinent to work with those mechanisms in order to fulfill the goals of my study.

Contrary to all expectations, results have shown that none of my hypothesis was valid. Empirical analysis revealed that neither team familiarity nor team training affects significantly team adaptability. The hypothesis regarding the interaction effect of the two predictor variables was also rejected.

The model proposed in this study seemed to me far from being counterfactual. As a matter of fact almost every piece of research on the subjected appeared to support each and every hypothesis advanced by me. Studies like those of Assudani (2011), Huckman, Staats, and Upton (2009), and Reagans, Argote, and Brooks (2005) consistently highlight the positive effect of familiarity on team performance. And dispersed team's performance is generally included in that equation (Assudani, 2011; Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003). Harrison et al. (2003) explained that team member familiarity reduces uncertainty about team members, which leads them to spend less time sharing information about each other, resulting in reduction of process losses and improved performance. They further stated that familiar teams create a communication flow that is more solid and more synchronized, thus, promoting coordination and task distribution, and reducing significantly the need for team interaction. Therefore, it should be reasonable to believe that team familiarity might be more helpful for teams that are more vulnerable to experience uncertainty about team members, more prone to suffer from problems like process losses and difficulties regarding communication, coordination and implementation of processes. Knowing that virtual teams carrying out missions in extreme environments match the

prior description, I expected to find corroboration for hypothesis 1 (*“There will be a positive main effect of team member familiarity on individual perceptions of adaptability.”*).

In terms of the impact of team training on team performance, literature also appeared to be very conclusive. For instance, Salas, Nichols, and Driskell (2007) found a significant tendency for team training to improve team performance ( $r = .29$ ). Those evidences were later reinforced by Salas and colleagues (2008) who discovered a positive effect of team training interventions on team outcomes. But support doesn't come only from the lab, as many mission teams already reproduce consistently team training interventions in order to improve many aspects of performance (Harrison et al., 2003; Ilgen et al., 2005). Take as example the testimony of *The Human Behavior and Performance (HBP) Training Work Group* working at NASA JSC who recommended ISS crew members to perform at least one technical training event as a team. According to them, teamwork is one of eight primary categories of training requirements and, therefore, it cannot be neglected (Human Behavior and Performance Training Working Group, 2007 - cit in Schmidt et al., 2009). Taking into consideration these and many other findings reported literature, I expected results to confirm hypothesis 2 of my study (*“There will be a positive main effect of team conjoint training on individual perceptions of adaptability”*).

In spite of all the apparently well grounded predictions, results were against all odds. Team familiarity wasn't found to have a positive effect on perceived team adaptability (hypothesis 1 rejected), and neither team training (hypothesis 2 rejected). With hypothesis 1 and 2 being rejected, it was unlikely for hypothesis 3 (*“The positive effect of team familiarity on individual perceptions of adaptability will be stronger when team training occurs in place of separate training.”*) to escape from a similar ending. And rejection was again confirmed. After further investigation, I began to reach understanding of the possible reasons behind the given results.

Perhaps the unexpected mismatch between results and hypothesis 1 resulted from ignoring one single, but very important, variable in my study. That key-measure, I believe, would be group longevity or mean project tenure (calculated by averaging the individual project tenures of all team members), which correspond to the time spent among team members as part of that work group, i.e. duration of familiarity.

Shepard (1956) laid the foundations for the comprehension of the relationship between group longevity and performance. He conducted his study with a sample composed by R&D (Research and Development) groups, and results revealed that performance increased up to 16 months of group longevity in average but decreased afterwards. Pelz and Andrews (1966), and Smith (1970) found identical curvilinear relations between group longevity and performance, and, in light of those relations, they identified a period of three to four years as the optimal group longevity. Katz (1982) also decided to study the relationship between group longevity and R&D project performance. His findings suggested that not only project performance was affected by group longevity, as it was highest in the 2- to 4-year interval and lower off that period. But results seem even more interesting when we focus on the post-five-year period. Katz (1982) has found that performance might begin and continue to decline for project groups that have worked together for five or more years.

The implications of these data to my study are significant since the scenarios included in our experimental task described a mission carried out by a team who had undertaken 5 years of intensive training. When scenarios were manipulated in order to test the effects of a 5-year long familiarity on adaptability, participant's perceptions may have been influenced by the group longevity, resulting in the rejection of hypothesis 1. The characteristics of my study's sample lend credibility to this idea. The fact that the participants were all students attending the fourth year of a Psychology course eventually made them capable of understanding the effects of group longevity in team performance since many students at this stage of college integrate work groups with peers they have known and worked with since early times of college. Additionally, I should note that most of the work developed by college students, like those attending the psychology course, is based on research, allowing me to draw a parallel between the daily work of the participants of my study and the one performed by the Research and Development groups that integrated the samples of the studies mentioned above, and, thus, leaving space to consider the possibility that Psychology student's may recognize the effects of long-term familiarity in team performance such as experienced by R&D groups. Therefore, I find reasonable to believe that results linked to hypothesis 1 should be analyzed not only inside the framework proposed in the section of literature review but also in light of theory of group longevity.

With respect to the divergence between results and hypothesis 2, justification may be found in some lack of precision regarding the manipulation of team training in the scenarios listed in the experimental study. When writing the scenarios for the study, variables manipulation was accomplished by choosing certain sentences that encoded the dichotomist conditions that reflect the two sides of the variables to be manipulated. The sentence chosen to represent the “team training” condition was the following: “During 5 years of intensive training, through training activities and team training missions, João (the team leader) and his team became familiar with the team that will be in command of the OCC. Both teams took part in simulation training activities where team members had to switch roles. By doing so, both teams were able to understand the type of tasks and challenges that they will have to cope with, and realize that the two of them are crucial for the success of the mission.”

Only afterwards I would come to realize that the sentence chosen to define the “team training” condition significantly emphasized the fact that during team training the group had the opportunity to play switch-roles tasks in order to generate shared knowledge among team members and to allow them to understand the whole operational demands of a successful mission. Such emphasis may have led to the disappointing results regarding the relationship between team training and team adaptability, since some evidences found in literature suggest that team training interventions centered in the exchange of roles and responsibilities among team members are not effective to enhance team performance (Goldstein & Ford, 2002). This kind of team training interventions falls in the class of “cross-training”. The main goal of cross training is the development of shared knowledge (Cannon-Bowers, Salas, Blickensderfer, & Bowers, 1998; Cooke et al., 2003; Volpe, Cannon-Bowers, Salas, & Spector, 1996), and team members accomplish it by training on each other’s roles and responsibilities (e.g., Blickensderfer, Cannon-Bowers, & Salas, 1998). Cross-training exercises may include positional clarification (receiving information on other roles), positional modeling (observing other roles), and positional rotation (performing different roles) (Blickensderfer et al., 1998).

The similarities found between the nature of cross-training and the description used to convey the team training condition in the study’s scenarios, as well as the literature reporting the absence of a positive effect of cross-training in performance,



both at individual- (Cannon-Bowers et al., 1998; Gorman, Cooke & Amazeen, 2010) and team-level (Goldstein & Ford, 2002), offer me another possible way of interpreting the results. However, since literature on the subject of cross-training is not unanimous with the perspective conveyed above, (e.g., Gorman, Cooke & Amazeen, 2010) further research must be addressed in order to clarify the actual impact of cross-training in team performance.

### ***Study Limitations***

The present study was an endeavor destined to reach better understanding of the way individuals perceive the existent or non-existent relationship between different team-relevant variables. Thus, in spite of testing how these relationships effectively establish in the actual context of virtual teams facing adverse circumstances, I decided to explore how those relationships manifested from the point-of-view of off-site individuals looking inside and simulating the experience of a mission team as if they were part of it, in the hope that results could offer good insight on team functioning. Upon that choice landed the first limitation of the study: the success of the present research was limited, in the first place, by the accuracy of individual's 'belief structures' and the ability of such individuals to evoke these structures through mental simulation. In a world full of subjectivity, how can someone determine the accuracy of person's belief structures. This may even resemble an impossible task, but resolution may become closer than expected if one can understand what really defines a belief structure. So, what is a belief structure?

Belief structures allow individuals to integrate inputs from the environment and convert them into forms and meanings. They have been also known as implicit theories, cognitive maps, assumptions and schemata, however the term 'belief structure' is the one that has received more support from researchers (Walsh, 1988). Fiske and Taylor defined a belief structure as a "cognitive structure that represents organized knowledge about a given concept or type of stimulus... It contains both the attributes of the concept and the relationships among the attributes" (1984: p. 140). Thus, belief structures work as facilitators of information acquisition and retrieval (Cantor & Mischel, 1977), and provide a basis for inference (Snyder and Uranowitz, 1978).

The information provided above fuels the idea that belief structures are a scientific tool we can rely on, however caution must be taken because belief structures can limit one's ability to understand certain spheres of information (Walsh, 1988), and, additionally, they may provide a representation of reality but they don't give access to reality itself. For instance, one can *believe* that would act cooperatively with someone who had just injured him if that attitude was crucial of the success of a mission conducted by both, however if that wasn't a hypothetical scenario things could actually go awry.

The mental simulation required to perform the experimental task of my study served as a cognitive interface between each participant's belief structures and his/her awareness of possible personal reactions to the situations conveyed in the experimental scenarios. The way mental simulations allow individuals to make inferences about how they would react in certain circumstances is through emotional prediction. Emotional prediction allows us to discover how we would react to (future) hypothetical events by pretending that those events are happening in the present (Gilbert & Wilson, 2009). Such exercise triggers an emotional reaction (anticipated emotion) that is perceived by the self as a reflection of what would feel like if that hypothetical scenario actually came true. Once we take into consideration that emotions strongly influence decision making (Damásio, 2003; Chiu et al., 2008; Elster, 1998), we easily conclude that mental simulations may provide a preview of possible courses of action we were likely to take on in a certain scenario.

Although mental simulations are one of the most effective tools used by researchers to manipulate affective states (e.g., Larsen & Ketelaar, 1991; Morrow & Nolen-Hoeksema, 1990; Strack, Schwarz, & Gschneidinger, 1985; Wright & Mischel, 1982), and such manipulation can be useful to predict one's future or possible behaviors in hypothetical scenarios, the potential of mental simulations to help understanding the behavior dynamics presents some limitations. According to literature, the content of mental simulations of future events flows out of one's network of information about similar events to that happened in the past (Hawkins & Blakeslee, 2004; Dudai & Carruthers, 2005; Addis, Wong, & Schacter, 2007; Buckner & Carroll, 2007), which means that our previews are only as good as the memories that originated them. We could draw a parallel between this phenomenon and the selective perception bias that occurs when people structure problems based on their own experience, even though that

experience may not sufficient to understand the problems at stake (Dearborn and Simon, 1958). Having in consideration that my study's participants were all students, most of them never worked professionally, and probably none have ever worked in similar settings to those addressed in the study's hypothetical scenarios, it is very likely that participant's previews were determined by memories scarcely representative of real mission events.

The fact that most of the study's participants had never worked professionally before may have influenced negatively the results, however other factors unrelated to the sample's features, like the environment in which the experience took place, may have exerted similar effects.

When we are asked to imagine how we would react in a certain situation, distant from the one we are experiencing in the present, even though we may feel confident to do it, the results can be pretty unrealistic. What happens is that the anticipated emotions we trigger as we mentally visualize an hypothetical scenario are influenced not only by the content of that preview (i.e., the features of the future event as we simulate them) but also by the context of that preview (i.e., the features of the actual context in which we are performing the mental simulation) (Gilbert & Wilson, 2009). One could argue that such effect belongs to common sense and, therefore, people would easily keep track of and avoid it, however research shows us that, in reality, people often fail to realize it (Loewenstein, O'Donoghue, & Rabin, 2003; Gilbert, Gill, & Willson, 2002; Van Boven & Loewenstein, 2003). Since the environment that surrounded the participant was extremely different from the one they were expected to simulate (the participants answered the questionnaire in a air-conditioned, wide room in silence, and the simulation involved a mission carried out in a narrow vehicle in an extremely hostile, highly stressful, life threatening environment), the previews generated by participants may be less accurate than what was originally expected.

Another important factor that must be addressed as a possible limitation of this study is related to the potential (or lack of it) of mental simulations to generate previews that span behaviors like adaptation. In a colleague of mine's study that integrates, along with my own research, a broader investigation, it was found a positive relationship between team training and perceived trust among team members. The fact that that research shared the same methodology of my study and, yet, managed to confirm a hypothesis well grounded in literature intrigued me, especially because research has

shown that team trust is positively related to team performance (Mach, Dolan & Tzafrir, 2010; Costa, Roe, & Taillieu, 2001). I wondered how could the methodology I adopted be inadequate for my study but not for my colleague's. After intense endeavor, I finally reached for a spark of enlightenment. The answer to that seeming paradox came from the comprehension of how the constructs trust and adaptation (adaptability) relate to the process of mental simulation.

Before addressing each construct I must shed light over the issue of mental simulation, in particular I must outline that mental simulations allow one to make forecasts based on affective reactions that occur in the present. Based on that premise, one can note that any construct that is conceptually and psychologically closer to affect should be more easily subjected to forecast. That is, I believe, the case of trust.

Interpersonal trust can be defined as a psychological state of individuals characterized by confidence and positive expectations about someone else's actions (Dirks & Skarlicki, 2004). Although much of the literature on trust argues that emotion appears in trust relationships as a result of cognitive processes (McAllister, 1997), Maier (2009) proposes a different theory. According to the author, before trust can become concrete and, thus, meet expression, one must develop, and enact, feelings of trust. Hence, Maier (2009) gives affect a main role in forging and managing trust. Other authors have woven similar considerations about the role of affect on trust. Erickson (1968), for instance, stated that emotion is important both to have and maintain trust in others. More recently, Möreling (2006) argued that the individual ultimately trusts, or not, because it feels right, regardless the objective criteria that could have led to such decision. Social exchange theories of trust also give support to Maier's (2009) theory. According to them, the expectation of positive emotion generally makes people more willing to trust, whereas the anticipation of negative emotions can make people less prone to give trust (Morrison & Milliken, 2000). In sum, the nature of anticipated emotions determines how the trust-giving decision is polarized.

The last statement has just given "trust" a "valid ticket" to mental simulations. This means that because of trust's nature and close relationship with affect, mental simulations can be a promising mean to test how trust would evolve in a team when other variables are manipulated, and, probably, that's why the results of my colleague's study converged with the hypothesis she posited and with what most research on the field seemed to suggest.

Contrary to trust, adaptation or adaptability may not be encoded realistically in mental simulations. Adaptation is one type of performance that not only cannot be directly informed by an anticipated emotion (as opposed to what happens with trust), as it occurs, when occurs, following an event that brings in new demands. In the case of the scenarios provided to the study's participants, adaptation was not explicit or mildly suggested. In mental simulations the future or the hypothetical scenarios focused on seem to be represented by their beginnings (Gilbert & Wilson, 2009). One consequence of emphasizing early occurring moments of the events is the aspects related to later moments (e.g., adaptation) tend to be ignored. But it gets even more complicated to keep track of adaptation through mental simulation because previews not only take into little account of it, as they tend to be insensitive to the features of an event that might promote it or inhibit it (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Gilbert, Lieberman, Morewedge, & Wilson, 2004; Gilbert, Morewedge, Risen, & Wilson, 2004; Gilbert & Ebert, 2002).

With all being said, the methodology based on mental simulations could serve a study trying to define a relationship between team training and perceived team trust, but not a study trying to define the relationship between team training and adaptation (adaptability).

### ***Practical Implications***

Although prior research supported the idea that both team familiarity and team training tend to enhance team performance, results of this study indicated that individuals don't recognize those relationships when the dimension of performance focused is adaptation, which mirrors the team adaptability. The results were interpreted as having been strongly influenced not by the actual relationships that link the study variables in practice but rather by the method applied to infer those relationships. Then, recommendations for the practice of investigation are proposed in order to allow future research to avoid the methodological obstacles that compromised the efficacy of the present research.

First, mental simulations should not be used as a tool to reach better understanding of how adaptation or adaptability relates to other variables, but trust, and other constructs with a stronger explicit relationship with affect, can be a target of mental simulations.

Additionally, results from studies involving assessment of the relationship between variables through answers given by participants to questionnaires should be analyzed with caution, especially if the participants are not close to nor familiar with the context in which those relationships actually take place.

### ***Future Research***

Beyond addressing the specific limitations noted above, future research could extend the present work in several ways in order to build more knowledge on the relationships between team familiarity and adaptability and between this and team training.

First, a similar study to this one should be conducted involving scenarios with different group longevity in order to assess the impact of that construct in team adaptability and, thus, confirm if the rejection of hypothesis 1 of this study was determined or not by the duration of team familiarity at stake in the scenarios.

Second, lab and field research should be conducted in order to analyze the relationships between the three variables addressed in this study but in the actual settings in which they are established, including the eventual moderating role of the variable team familiarity in the relationship between team training and adaptability.

Additionally, when studying team training, different training strategies should be addressed separately (e.g., cross-training, coordination and adaptation training, procedural training) once they have distinct content and, thus, their effectiveness may differ (Salas et al., 2007).

Finally, future research should address not only the influence of team familiarity on team adaptability but also how task familiarity may moderate that effect. We consider relevant to address this issue because it is not clear yet if team and task familiarity have additive or complementary effects on team performance (Goodman & Leyden (1991). If in the one hand both team and task familiarity have been positively related to team performance (Harrison et al., 2003), in the other hand some aspects of one type of familiarity may overlap with aspects of the other. For instance, it may occur that both have the potential to facilitate the team communication processes or to make team members feel more psychologically safe, thus proving team and task familiarity to be to some level substitutable.

## Conclusion

Today, teams are ubiquitous (Marks, 2006). The many advantages they represent to organizations, allied to the development of cutting-edge technology have been allowing them to reproduce worldwide labeled as virtual teams (Orasanu & Salas, 1993; Bell & Kozlowski, 2002). Virtual work, then, offers a unique range of advantages like the possibility to interact without being face-to-face, being cost efficient, and providing means for better utilization of distributed human resources (Lipnack & Stamps, 1999). However, the lack of a shared common ground can lead to communication deficiencies. For instance, Hinds and Weisband (2003) found that virtual team members communicate less, holding the flow of relevant information, then co-located team members in initial stages to work, which can have a negative effect on team performance.

Mission teams are a less common type of teams but regardless their minority their work can be of extreme importance (e.g., space flight crews) and the tough conditions of the scenarios in which they perform make virtual work especially critical for their success (it may save or ruin them). Then, when starting a quest, mission teams should be ready to cope with the most adverse of circumstances, and, therefore, team members should be provided in advance with the most appropriate conditions to develop the necessary abilities to accomplish conjointly the goals defined for the mission. In the present research I focused on studying the impact of team familiarity and team training on the adaptability of mission teams. Instead of conducting a field study I decided to draw conclusions from a questionnaire answered by Psychology students in which they were asked to imagine they had taken part in a mission team with specific features and, then, were asked to select the behaviors they thought they would incur in when dealing with dramatic and life-threatening change.

I hypothesized that both team training and team familiarity would be positively related to perceived team adaptability, and this last construct would be perceived as higher in conditions where both team training and team familiarity occurred.

None of my hypothesis was confirmed however good insights were provided regarding the reasons behind it, which I expect to be useful for guiding future research. For instance, I argued that mental simulations are not an adequate tool to explore the relationship of adaptability other variables. I also contended that when conducting

studies off-site, conclusions should be drawn with caution once the experimental conditions should be similar to those of the addressed issue in order to make the participant's contribution more realistic.



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